OBSERVATIONS ON THE HABITS OF SOME TASMANIAN CRUSTACEA.

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In the past, the study of the external form of the higher Crustacea has been carried out mainly from a systematic standpoint, with a view to establishing the inter-relationships of the numerous forms. During recent years, attention has been focussed on the way in which the animals live and the manner of use of their complicated limbs. It is only when function is co-related with form that we can begin to understand the animal as a whole. This point of view opens up another method of tackling the question of the derivation of one type of animal from another, and elucidating the course of evolution within a group from living forms of the present day.

Among its interesting fauna, Tasmania is rich in possessing two species of "shrimp," *Paranaspides* and *Anaspides*, which are confined to the island. They are survivors of a group of Crustacea now extinct, except for *Koonunga* found spasmodically near Melbourne, and a few other minute forms. This group equals in rank the Decapoda, which comprises the numerous living crabs, lobsters, prawns and "shrimps." *Anaspides* and *Paranaspides*, moreover, have existed in this region for countless millions of years, probably since Permo-carboniferous times, and have little changed during that space. Thus, these shrimps appear at the present day almost as living fossils, and an examination of their modes of life and movements of limbs presents an interesting field for comparison with the more modern Crustacea.

A comparative study of the feeding mechanisms of the higher Crustacea indicates that the ancestral forms were, in all probability, filter-feeders, a stream of water being drawn forward along the mid-ventral line and passing out sideways between the maxillule and maxilla. Particles in suspension would be deposited on a filtering plate of setæ, borne on the base of the maxilla, and would then be brushed forwards to the mouth by the combined action of the first trunk limb and the maxillule. In the more specialised modern forms, a rotatary action of the trunk limb exopodites aids in the production of the food stream, and in the most specialised types filter-feeding has been abandoned.

An examination of *Paranaspides*, a free-swimming form, confined to the weedy parts of the Great Lakes, shows it to

be a perfect filter-feeder in the manner indicated above, the mouth parts being used as in a filter-feeding mysid. The trunk exopodites beat in an oar-like manner, a type of motion to be expected in a primitive form, but so far not exhibited by any other Malacostracan which has been examined. The shrimp, however, is specialised, in that it is well suited to scrape up algal slime off the weeds with its mouth parts, and it also has an auxiliary food stream from the thorax, created in a unique manner.

Anaspides, found in many Tasmanian mountain streams and tarns, shows a further step towards specialisation. It is more bottom-crawling in its habits, and does not filter the water in which it swims, although its mouth parts closely resemble those of *Paranaspides*. However, it uses part of its filtratory apparatus to collect small particles of algal and diatom growth, which it scrapes off the weeds and stones without letting such particles be swept away by the flowing water. It subsidises this diet, when possible, by feeding on large food, such as worms and tadpoles, portions of its mouth parts being well adapted for this purpose.

Finally, *Koonunga*, the most specialised of the three, has given up filter-feeding entirely, as have the more specialised Malacostraca of other groups.

Anaspides is now abundant in some of the mountain streams, attaining a length of 1¼ inches. It can be very active, but it is not at all well able to withstand competition with other forms. A small caddis worm, one-quarter the size, can kill an Anaspides by a single bite. The now limited locality in which the shrimp is found may be due to the lack of competition in the mountain streams where *Anaspides* reigns supreme.

Paranaspides used to be abundant in the Great Lake, but during the last few years has been unobtainable. Its partial disappearance is, doubtless, co-related with the raising of the water level by the dam, an increase of 22 feet being realised during the past eight years. The weeds on the old Lake bottom were largely killed, and with them disappeared *Paranaspides*. Growth of new weeds in the new shallow water is a comparatively slow process, so that, in many parts of the Lake, weeds were temporarily absent. The "shrimp," however, has been found this year in certain places at the north end, where weeds cover old bottom, originally two feet deep.

The presence of *Paranaspides* in the Lake is of some economic importance, since this form and *Phreatoicus*, another Crustacean limited to this part of the world, have

been largely responsible for the wonderful growth of the Lake trout. At present, *Phreatoicus* alone has been able to accommodate itself to changed conditions. It can be found abundantly near the new shores, and is largely maintaining the trout in food in certain places. It is a bottom-liver, favoring stony places, feeding much as an earthworm does. *Paranaspides*, on the other hand, is dependent upon the weeds, probably for suitable food and shelter from predaceous enemies, and also for laying its eggs. As the weeds become re-established in the Lake, it is to be hoped that *Paranaspides* will spread and become re-established throughout.

Other lakes in Tasmania are notably poor in invertebrates, and the trout in such lakes are underfed. A suggestion has been made to attempt the transference of *Phreatoicus* to these waters, in order to increase the food for the trout. *Phreatoicus* has been far more resistant to changed conditions in the Great Lake than has *Paranaspides*, and possibly could be introduced successfully to other lakes.

WHITE-FLOWERING BORONIAS.

The usual colour of *Boronia pinnata*, Pinnate Boronia, growing in the Grampian Mountains is pink; but recently I found near Mt. William a plant bearing pure white flowers. It is generally accepted as a fact that the earliest petals of flowers were yellow, and that, originally, all flowers were of that colour; the order of development of colour in flowers appears to be yellow, pink, red, purple, lilac, up to deep blue, while white may occur in any normally-coloured flower, hence white flowers in our Boronias may be called sports or albinos.

A blue-flowering Boronia, *B. caerulescens*, occurs in the Grampians, and has also been observed to bear occasional white flowers. Brightly-coloured flowers frequently revert to yellow, as, for instance, *Gompholobium Huegelii*, a yellow, being the colour of the originally described species. The petals of the Brown Boronia, *B. megastigma*—one of the most popular—are dark purple outside, drying almost black, and yellowish inside. It is endemic to Western Australia, and is very largely cultivated for sale; it is the only Boronia suitable for perfumery purposes. A bright yellow-flowering sport is recorded from Albany, W.A.

One of the prettiest Boronias is *B. serrulata*, a native of New South Wales, and there called "Native Rose"—the popular name evidently alludes to the close clusters of pink flowers which grow on the end of each branch, and have a strong, aromatic scent. The name is, of course, inapplicable, but too widespread for correction. Some 80 distinct species of Boronia are found in Australia, and about half the number are endemic to Western Australia.

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